

WHAT IS CLAIMED IS:

1 1. A method for stabilizing a valve annulus of a heart for performing a
2 procedure on the valve annulus, the method comprising:
3 introducing at least a first stabilizing member beneath one or more leaflets of a
4 valve of the heart to engage the annulus at an intersection between at least one leaflet and an
5 interior ventricular wall of the heart; and
6 applying force to the first stabilizing member to stabilize the valve annulus.

1 2. A method as in claim 1, wherein introducing comprises passing the
2 member beneath at least the posterior leaflet of the mitral valve of the heart.

1 3. A method as in claim 1, wherein applying force to the first stabilizing
2 member exposes the valve annulus from surrounding tissue of the heart.

1 4. A method as in claim 1, wherein introducing comprises advancing an
2 elongate catheter carrying the first stabilizing member through vasculature of a patient to the
3 heart, wherein the first stabilizing member is adapted to change between a flexible
4 configuration for introduction through the vasculature and a curved configuration to conform
5 to the annulus.

1 5. A method as in claim 4, further comprising changing the shape of the
2 first stabilizing member to conform to the annulus.

1 6. A method as in claim 5, wherein changing the shape of the first
2 stabilizing member comprises articulating the stabilizing member in at least two directions.

1 7. A method as in claim 5, wherein changing the shape of the first
2 stabilizing member comprises applying tension to at least a first tensioning cord to cause a
3 first bend in the stabilizing member.

1 8. A method as in claim 7, wherein changing the shape further comprises
2 applying tension to at least a second tensioning cord to cause a second bend in the stabilizing
3 member.

1 9. A method as in claim 8, wherein the first bend comprises
2 approximately a C-shaped bend to conform the stabilizing member to the annulus, and the
3 second bend comprises an upwardly directed bend.

1 10. A method as in claim 5, wherein changing the shape of the first
2 stabilizing member comprises introducing a fluid into a shape-memory stabilizing member.

1 11. A method as in claim 5, further comprising locking the shape of the
2 first stabilizing member.

1 12. A method as in claim 1, wherein applying force to the first stabilizing
2 member comprises applying upwardly directed force in a direction from the ventricles toward
3 the atria of the heart.

1 13. A method as in claim 1, wherein stabilizing further comprises
2 introducing at least a second stabilizing member over the valve leaflets.

1 14. A method as in claim 13, further comprising moving the second
2 stabilizing member toward the first stabilizing member to further stabilize the valve annulus.

1 15. A method for stabilizing a valve annulus of a heart for performing a
2 procedure on the valve annulus, the method comprising:
3 advancing a flexible, elongate stabilizing catheter through vasculature of a
4 patient to the heart;
5 introducing at least a first stabilizing member of the stabilizing catheter
6 beneath one or more leaflets of a valve of the heart to engage the annulus at an intersection
7 between at least one leaflet and an interior ventricular wall of the heart;
8 changing the shape of the stabilizing member to conform to the annulus; and
9 applying force to the stabilizing member to stabilize the valve annulus.

1 16. A method as in claim 15, wherein changing the shape of the first
2 stabilizing member comprises articulating the stabilizing member in at least two directions.

1 17. A method as in claim 15, wherein changing the shape of the first
2 stabilizing member comprises applying tension to at least a first tensioning cord to cause a
3 first bend in the stabilizing member.

1 18. A method as in claim 17, wherein changing the shape further
2 comprises applying tension to at least a second tensioning cord to cause a second bend in the
3 stabilizing member.

1 19. A method as in claim 18, wherein the first bend comprises
2 approximately a C-shaped bend to conform the stabilizing member to the annulus, and the
3 second bend comprises an upwardly directed bend.

1 20. A method as in claim 15, wherein changing the shape of the first
2 stabilizing member comprises introducing a fluid into a shape-memory stabilizing member.

1 21. A method as in claim 15, further comprising locking the shape of the
2 first stabilizing member.

1 22. A method as in claim 15, wherein applying force to the first stabilizing
2 member comprises applying upwardly directed force in a direction from the ventricles toward
3 the atria of the heart.

1 23. A method as in claim 15, wherein stabilizing further comprises
2 introducing at least a second stabilizing member over the valve leaflets.

1 24. A method as in claim 23, further comprising moving the second
2 stabilizing member toward the first stabilizing member to further stabilize the valve annulus.

1 25. A method for constricting a valve annulus in a beating heart, the
2 method comprising:
3 introducing at least a first stabilizing member beneath one or more leaflets of a
4 valve of the heart to engage the annulus at an intersection between at least one leaflet and an
5 interior ventricular wall of the heart of the heart;
6 applying force to the first stabilizing member to stabilize the valve annulus;
7 and
8 constricting at least a portion of the valve annulus while the valve annulus
9 remains stabilized.

1 26. A method as in claim 25, further comprising:
2 introducing at least a second stabilizing member over the valve leaflets; and

3 moving the second stabilizing member toward the first stabilizing member
4 further stabilize the annulus.

1 27. A method as in claim 26, wherein constricting comprises attaching a
2 mechanical support structure to at least a portion of the valve annulus.

1 28. A method as in claim 27, wherein the mechanical support structure
2 comprises a ring or a system of anchors and tethers.

1 29. A method as in claim 26, wherein constricting comprises applying
2 energy to shrink at least a portion of the annular tissue.

1 30. A method for constricting a valve annulus in a beating heart, the
2 method comprising:

3 introducing at least a first stabilizing member beneath one or more leaflets of a
4 valve of the heart to engage the annulus at an intersection between at least one leaflet and an
5 interior ventricular wall of the heart of the heart;

6 applying force to the first stabilizing member to stabilize the valve annulus;

7 securing individual anchors at circumferentially spaced-apart locations about
8 at least a portion of the valve annulus while the valve annulus remains stabilized; and

9 cinching a tether through the anchors to circumferentially tighten the annulus.

1 31. A method as in claim 30, further comprising:

2 introducing at least a second stabilizing member over the valve leaflets; and

3 moving the second stabilizing ring toward the first stabilizing ring to further
4 stabilize the annulus.

1 32. A method as in claim 31, wherein securing the anchors comprises
2 driving the anchors from one of the first and second stabilizing members.

1 33. A method as in claim 32, wherein driving the anchors from one of the
2 first and second members comprises inflating an expandable balloon in one of the members
3 to force the anchors at least partially out of the member into tissue of the valve annulus.

1 34. A method as in claim 32, wherein securing the anchors further
2 comprises driving the anchors through tissue of the valve annulus into an anchor receiving
3 piece coupled with the other of the first and second stabilizing members.

1 35. A device for accessing a valve annulus of a heart, the device
2 comprising:
3 an elongate body having a proximal end and a distal end; and
4 a first stabilizing member at the distal end of the body, wherein the first
5 stabilizing member is positionable under one or more leaflets of a valve of the heart to engage
6 a length of the annulus along an intersection between at least one leaflet and an interior
7 ventricular wall of the heart.

1 36. A device as in claim 35, wherein the elongate body comprises a rigid
2 shaft.

1 37. A device as in claim 35, wherein the elongate body comprises a
2 flexible catheter, so that the first stabilizing member may be positioned in the heart and under
3 the one or more leaflets via a transvascular approach.

1 38. A device as in claim 37, wherein the first stabilizing member
2 comprises a shape-changing portion.

1 39. A device as in claim 38, further comprising at least a first tensioning
2 cord coupled with the shape-changing portion for applying tension to the shape-changing
3 portion to cause it to bend in at least a first direction.

1 40. A device as in claim 39, further comprising at least a second tensioning
2 cord coupled with the shape-changing portion for applying tension to the shape-changing
3 portion to cause it to bend in at least a second direction.

1 41. A device as in claim 40, wherein the first direction comprises
2 approximately a C-shape for conforming to the annulus and the second direction comprises
3 an upward or proximal direction for applying force to the annulus.

1 42. A device as in claim 39, wherein the shape-changing portion includes
2 multiple notches along at least one side to control bending into a curve which conforms to the
3 shape of the annulus.

1 43. A device as in claim 39, wherein the shape-changing portion comprises
2 multiple stacked segments coupled with at least the first tensioning member to control
3 bending into the shape of the annulus.

1 44. A device as in claim 38, wherein the shape-changing portion comprises
2 a shape-memory material configured to conform to the shape of the annulus.

1 45. A device as in claim 44, wherein the shape-changing portion further
2 comprises at least one lumen for introducing a fluid to cause the shape-memory material to
3 conform to the shape of the annulus.

1 46. A device as in claim 35, wherein the first stabilizing member
2 comprises:
3 a semicircular housing;
4 a plurality of tethered anchors disposed within the housing; and
5 at least one expandable balloon for driving the plurality of anchors into tissue
6 of the valve annulus.

1 47. A device as in claim 46, wherein the anchors are selected from the
2 group consisting of curved hooks, straight barbed hooks, clips, T-shaped fasteners, helical
3 fasteners, rings, and shape memory fasteners.

1 48. A device as in claim 46, further comprising at least one mandrel for
2 releasably coupling the anchors with the housing.

1 49. A device as in claim 48, wherein the anchors comprise a plurality of
2 curved hooks, and wherein the mandrel comprises a pivot mandrel around which the hooks
3 pivot to engage annular tissue.

1 50. A device as in claim 46, further comprising:
2 an inflation actuator for inflating the expandable balloon;
3 a release actuator for releasing the anchors from the housing; and
4 a cinching actuator for cinching a tether coupled with the tethered anchors to
5 reduce a diameter of the valve annulus.

1 51. A device as in claim 46, further comprising at least a second stabilizing
2 member movably coupled with the elongate shaft, wherein the second stabilizing member
3 may be moved toward the first stabilizing member to further stabilize the valve annulus.

1 52. A device as in claim 51, further comprising at least one anchor
2 receiving piece coupled with the second stabilizing member for receiving distal ends of the
3 plurality of anchors driven through the tissue of the valve annulus.

1 53. A device as in claim 35, wherein the first stabilizing member
2 comprises at least one deployable mechanical support structure for constricting the valve
3 annulus.

1 54. A device as in claim 53, wherein the mechanical support structure
2 comprises at least one shape memory stent couplable with the valve annulus, wherein the
3 stent longitudinally shrinks when deployed to constrict the valve annulus.

1 55. A device as in claim 35, wherein the first stabilizing member
2 comprises at least one energy delivery member for delivering energy to the valve annulus to
3 constrict the annulus.

1 56. A device as in claim 55, wherein the energy delivery member
2 comprises a radiofrequency delivery member.

1 57. A device as in claim 35, wherein the first stabilizing member
2 comprises at least one drug delivery member for delivering at least one drug to the valve
3 annulus to constrict the annulus.